US009134089B2

(12) **United States Patent**
Yang

(10) **Patent No.: US 9,134,089 B2**
(45) **Date of Patent: Sep. 15, 2015**

(54) **AIRSOFT GUNS STRUCTURE WITH IMPROVED REALITY AND SAFETY GASIFICATION SYSTEM FOR THE COMPRESSED GAS CARTRIDGE**

(75) Inventor: **Tsung-Yun Yang**, Taipei (TW)

(73) Assignees: **Yen-Ting Liao**, Taipei (TW); **Tsung-Yun Yang**, Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 72 days.

(21) Appl. No.: **13/989,886**

(22) PCT Filed: **Nov. 10, 2011**

(86) PCT No.: **PCT/CN2011/082008**

§ 371 (c)(1),
(2), (4) Date: **May 28, 2013**

(87) PCT Pub. No.: **WO2012/071973**

PCT Pub. Date: **Jun. 7, 2012**

(65) **Prior Publication Data**

US 2013/0247893 A1 Sep. 26, 2013

(30) **Foreign Application Priority Data**

Nov. 30, 2010 (CN) 2010 1 0572095

(51) **Int. Cl.**

F41B 11/00	(2013.01)
F41B 11/55	(2013.01)
F41B 11/89	(2013.01)
F41B 11/50	(2013.01)
F41B 11/62	(2013.01)
F41B 11/721	(2013.01)
F41A 21/16	(2006.01)

(52) **U.S. Cl.**

CPC ***F41B 11/00*** (2013.01); ***F41A 21/16*** (2013.01); ***F41B 11/50*** (2013.01); ***F41B 11/55*** (2013.01); ***F41B 11/62*** (2013.01); ***F41B 11/721*** (2013.01); ***F41B 11/89*** (2013.01)

(58) **Field of Classification Search**

USPC 124/73–76, 56; 434/18

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,079,525	A *	3/1978	Linton et al.	434/18
4,480,999	A *	11/1984	Witherell et al.	434/18
4,725,235	A *	2/1988	Schroeder et al.	434/18
4,955,812	A *	9/1990	Hill	434/16
5,244,431	A *	9/1993	D'Andrade	446/406
5,569,085	A *	10/1996	Igarashi et al.	463/49
5,857,854	A *	1/1999	Kwalwasser	434/18
5,947,738	A *	9/1999	Muehle et al.	434/16
6,682,350	B2 *	1/2004	Kehl et al.	434/18
7,033,175	B2 *	4/2006	Kunimoto	434/18
7,730,881	B1 *	6/2010	Pedicini et al.	124/65
7,806,113	B2 *	10/2010	Skilling	124/73
8,360,042	B2 *	1/2013	Skilling	124/71

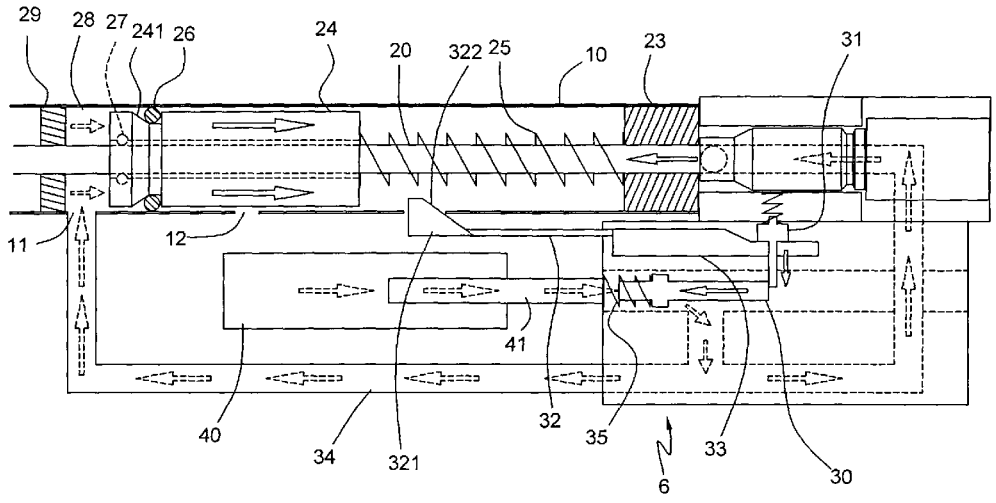
(Continued)

Primary Examiner — Michael David

(57) **ABSTRACT**

An airsoft gun structure redesigns the conventional high-pressure toy gun to shunt high-pressure air flow during shooting. Therefore, the shunted high-pressure air flow simulates recoils as real bolt-action, single-shot rifles. Also, the ammunition supply includes different cartridges to select one of the supply-type by the users and whether shell case ejection or not. When the airsoft gun is operated, the realistic action is achieved to enhance the fun of shooting. Furthermore, the dual hop up system makes the flight path of bullets more stable without shift. Moreover, the safety gasification system could make the supplied amount of the output compressed high pressure air be almost constant to enhance security during operation.

3 Claims, 12 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

8,578,922	B1 *	11/2013	Granger	124/74
2004/0137411	A1 *	7/2004	Kemp et al.	434/11
2005/0000505	A1 *	1/2005	Pedicini et al.	124/63
2005/0074726	A1 *	4/2005	Metcalfe et al.	434/18
2005/0260545	A1 *	11/2005	Schavone	434/18
2009/0277436	A1 *	11/2009	Wei	124/74
2010/0227298	A1 *	9/2010	Charles	434/18
2011/0017187	A1 *	1/2011	Brock	124/71
2011/0271940	A1 *	11/2011	Meggs et al.	124/56
2011/0271941	A1 *	11/2011	Meggs	124/65
2011/0287388	A1 *	11/2011	Hu	434/18
2011/0318715	A1 *	12/2011	Markert et al.	434/18
2012/0129136	A1 *	5/2012	Dvorak	434/18
2013/0291848	A1 *	11/2013	Wood	124/73
2014/0065577	A1 *	3/2014	Quinlan et al.	434/18

* cited by examiner

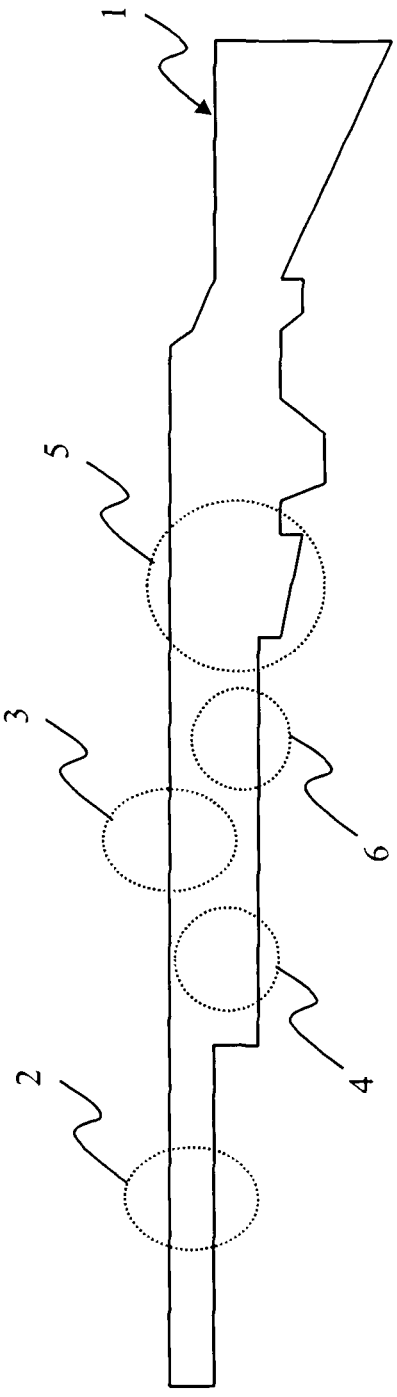


FIG. 1

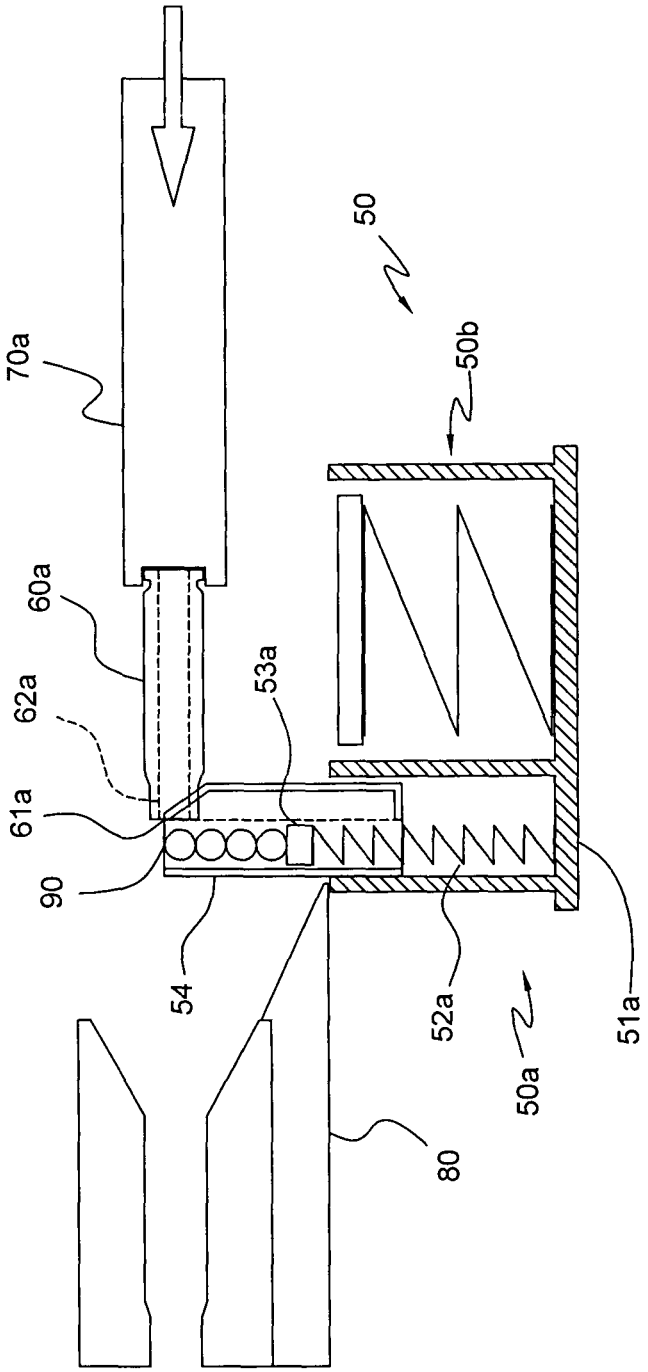


FIG. 2A

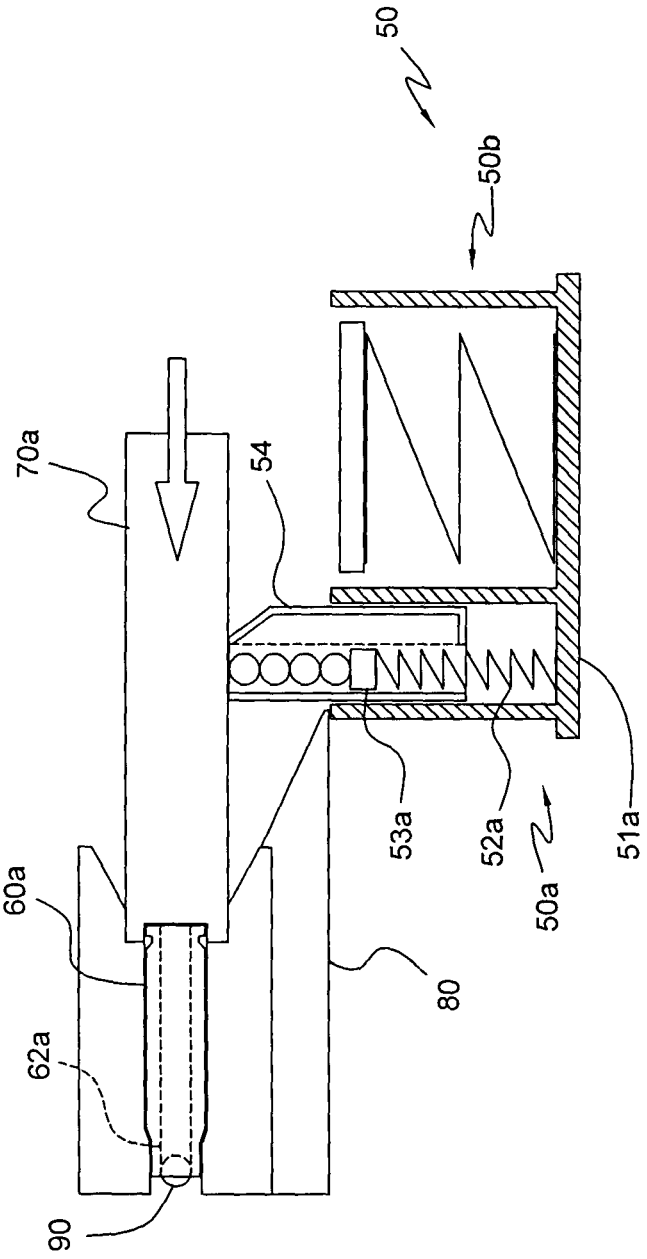


FIG. 2B

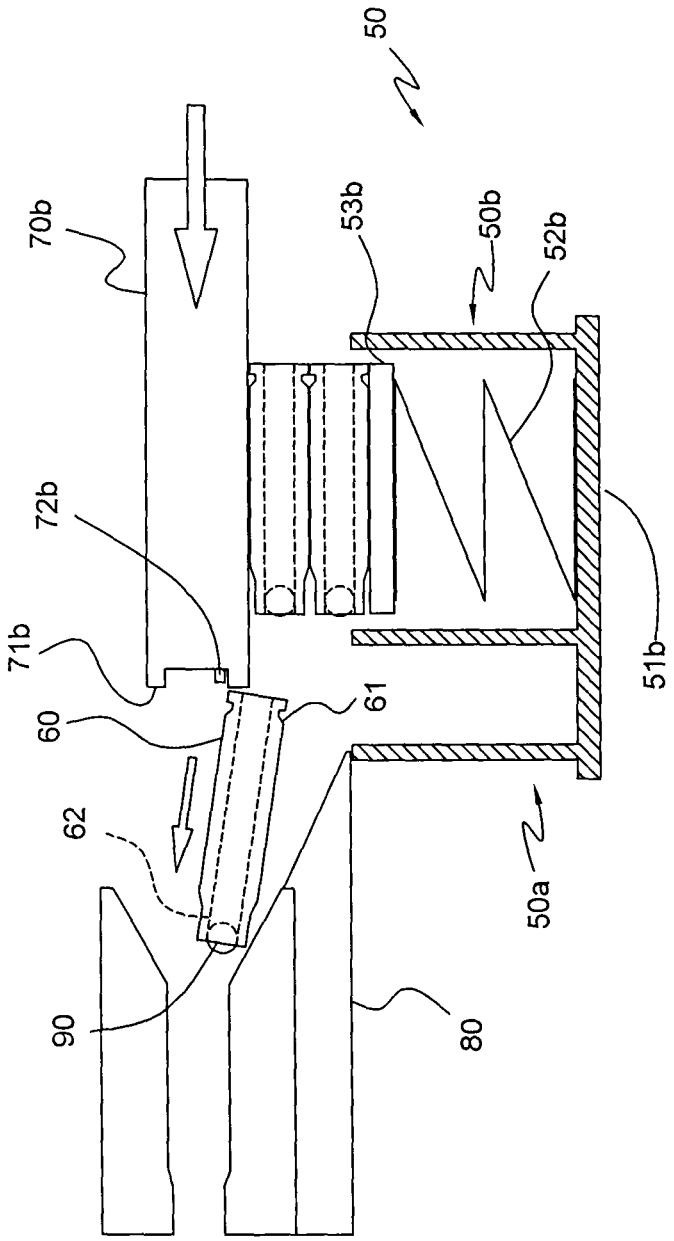


FIG. 2C

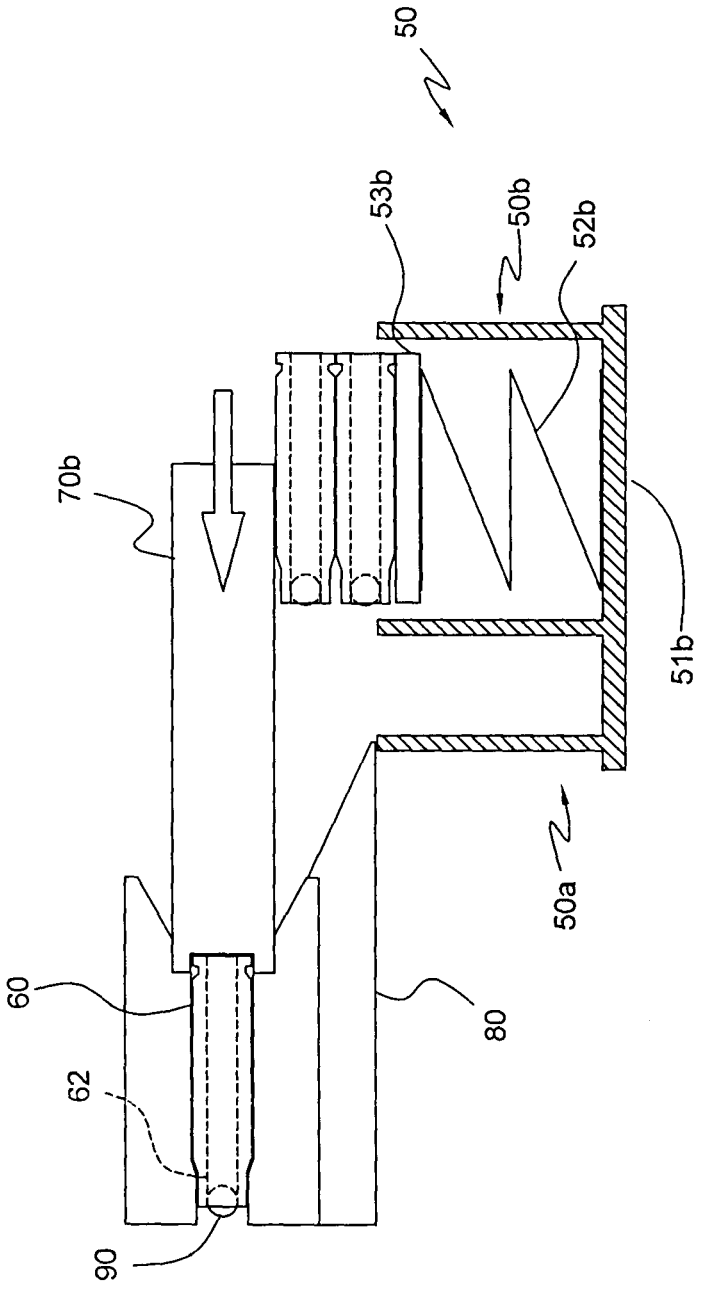


FIG. 2D

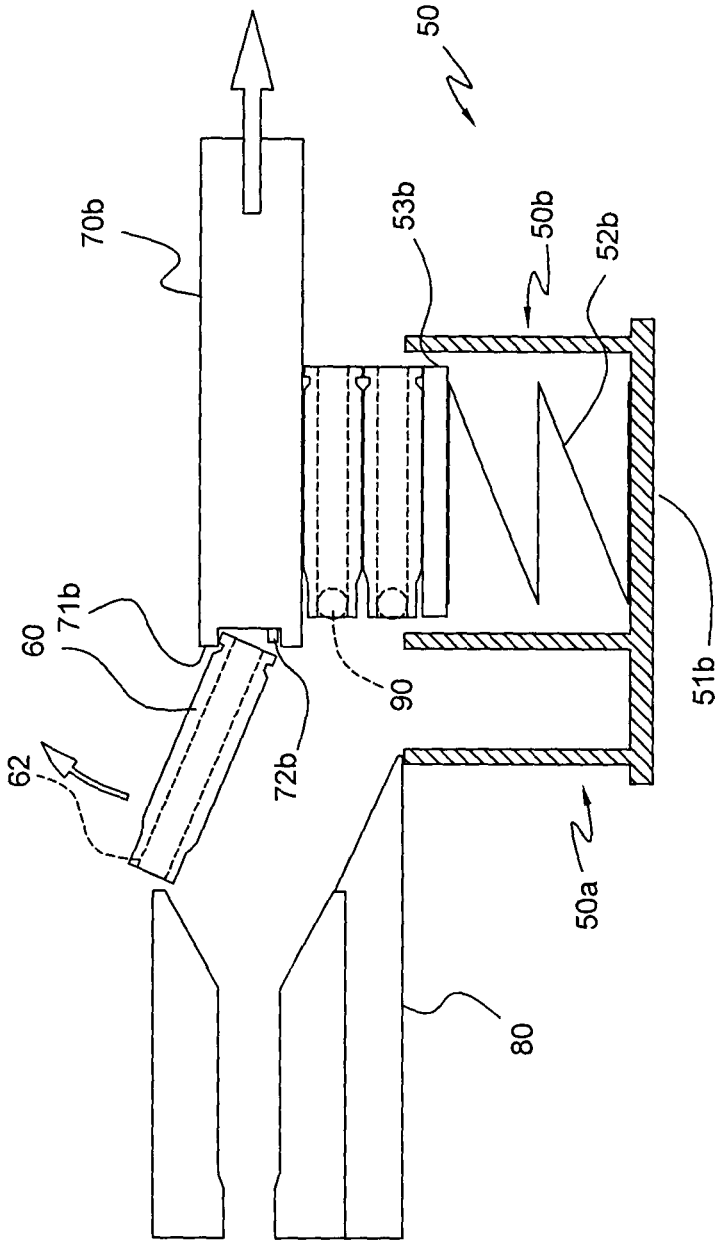


FIG. 2E

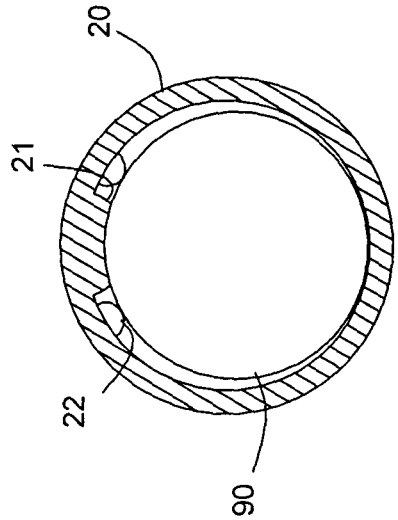


FIG. 3B

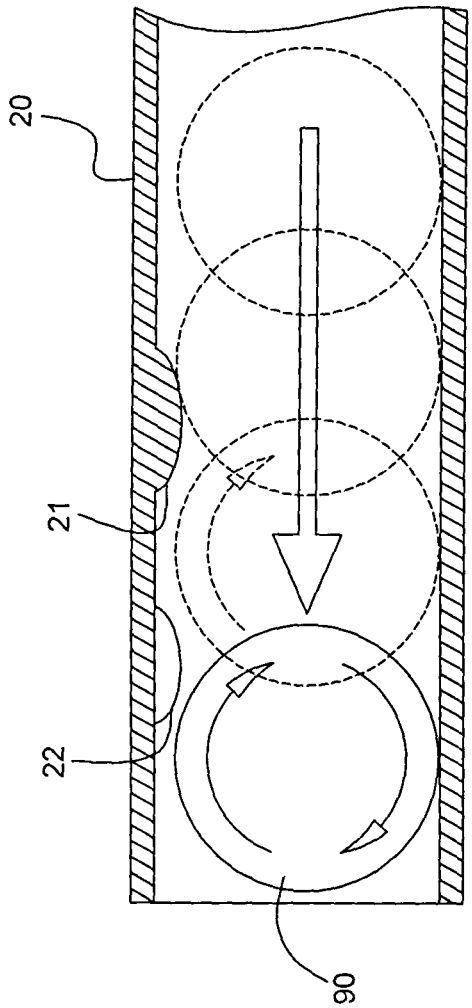


FIG. 3A

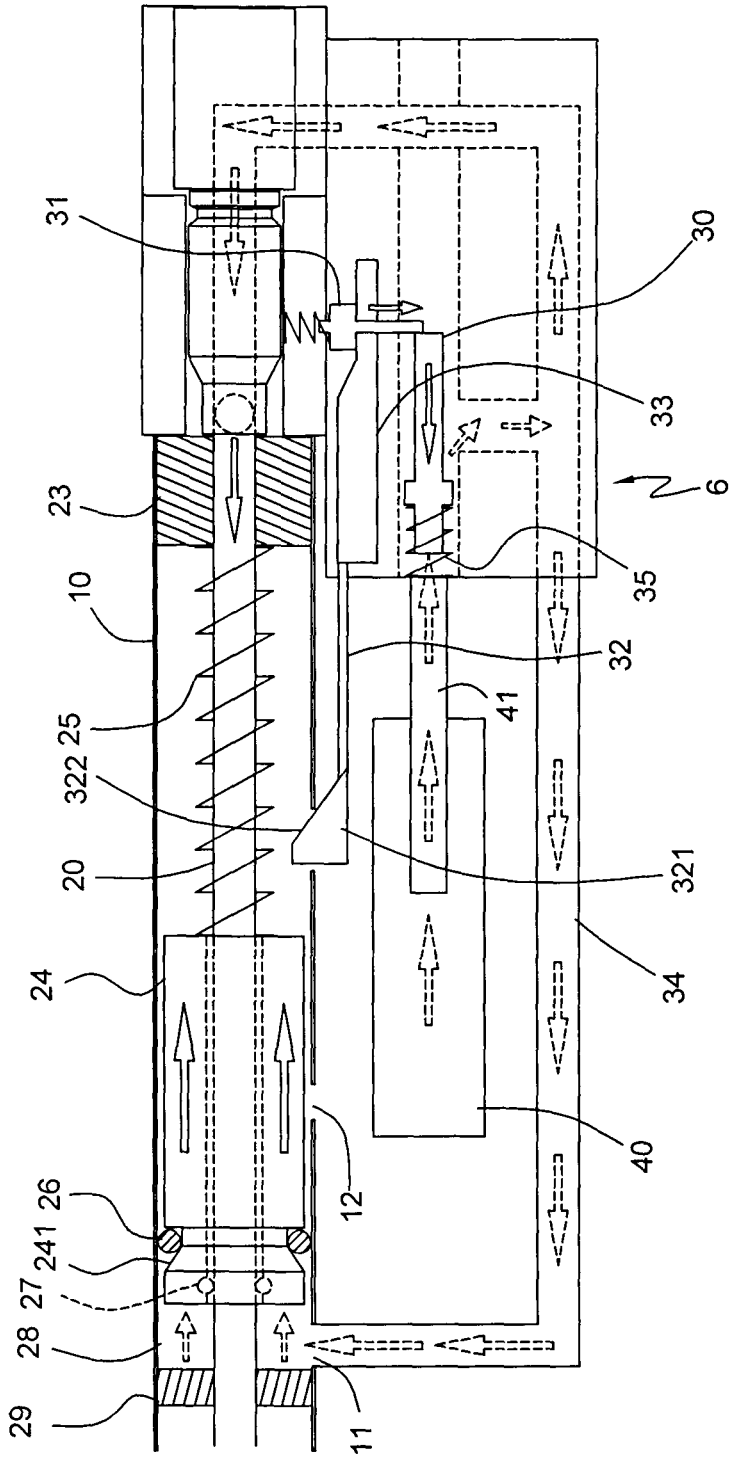


FIG. 4A

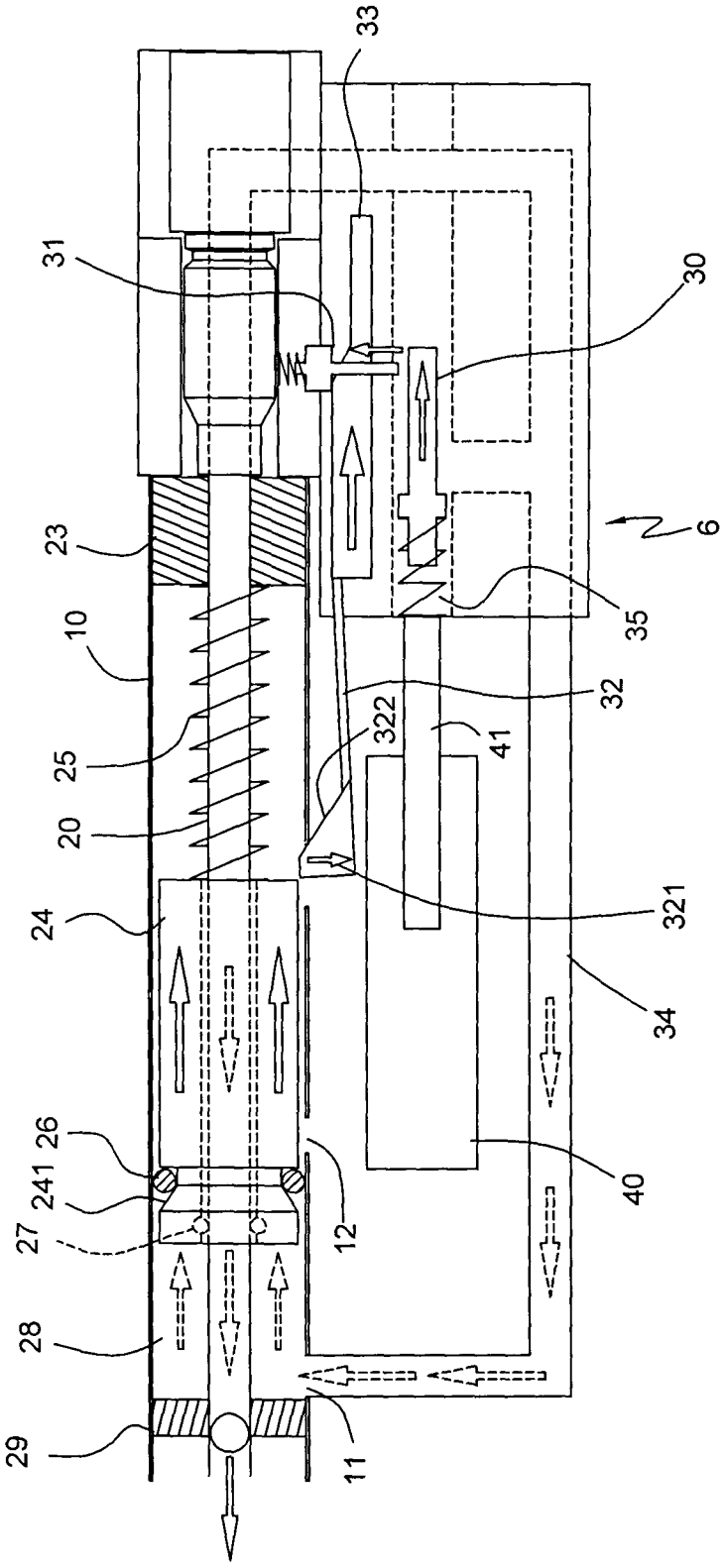


FIG. 4B

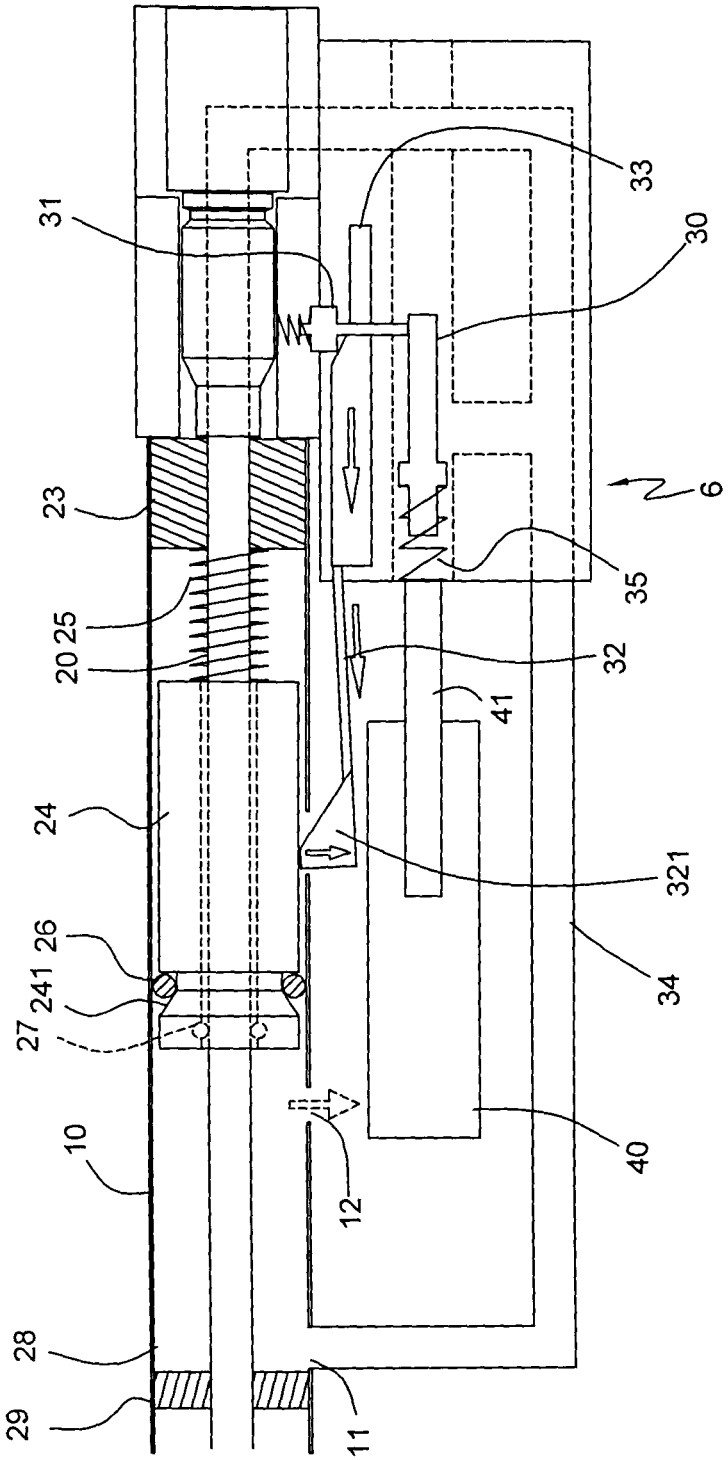


FIG. 4C

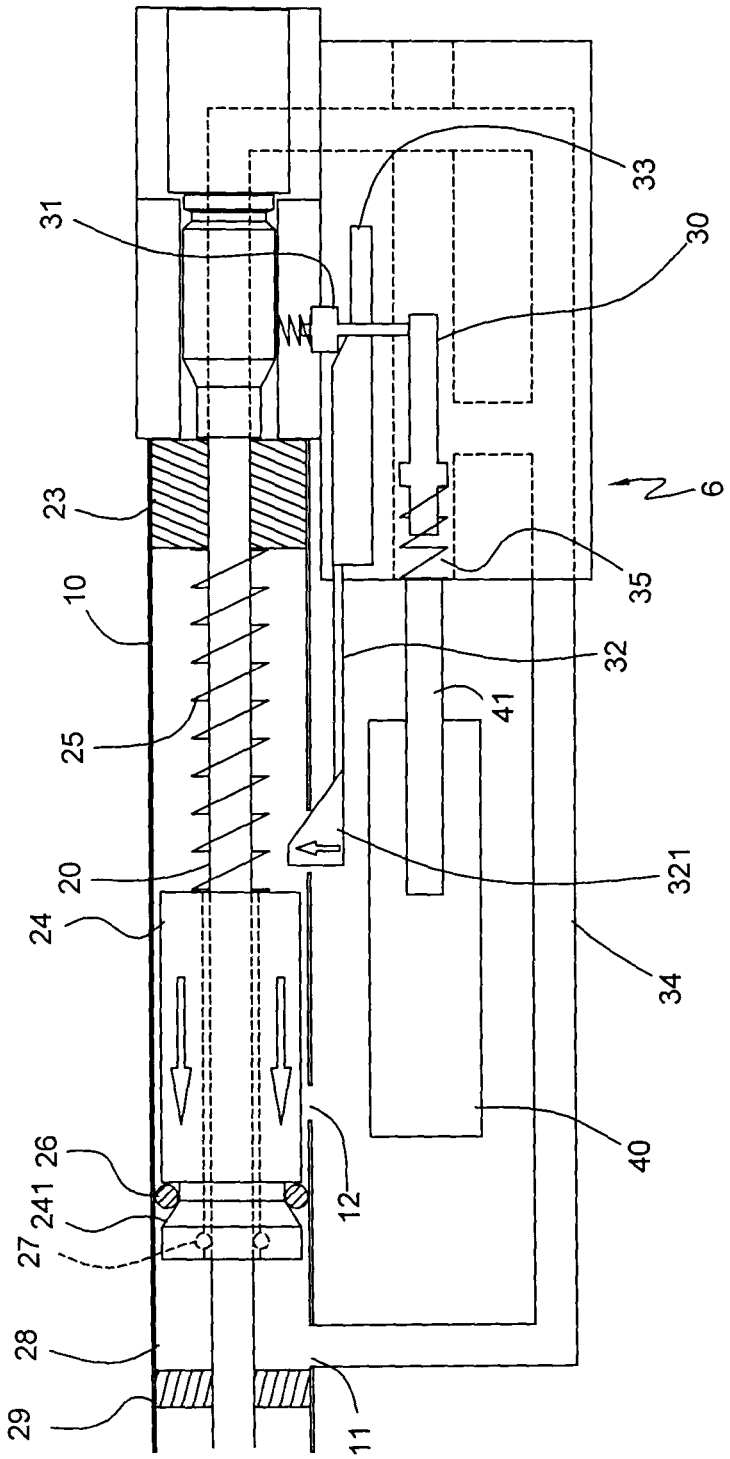


FIG. 4D

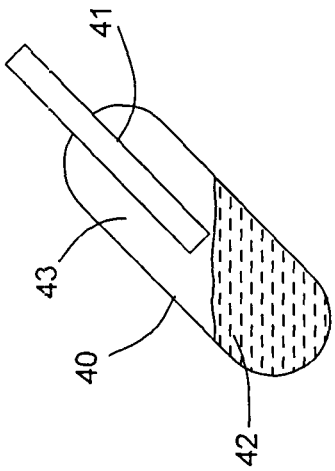


FIG. 5B

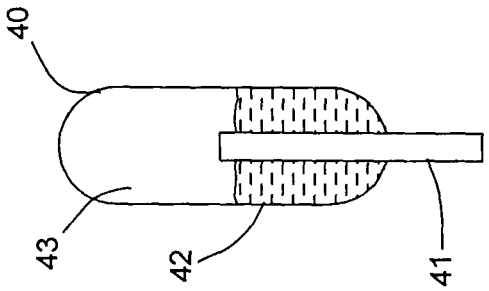


FIG. 5D

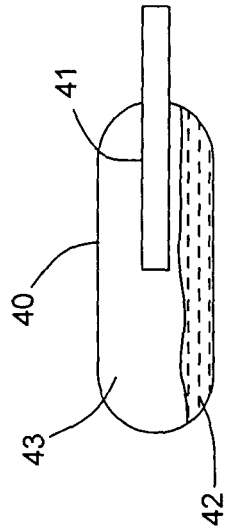


FIG. 5A

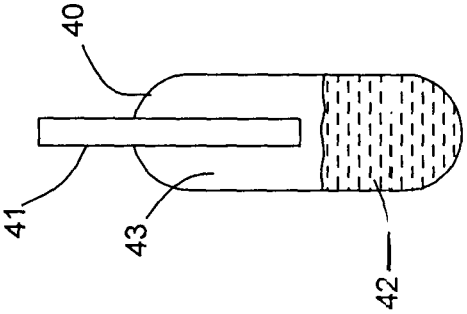


FIG. 5C

AIRSOFT GUNS STRUCTURE WITH IMPROVED REALITY AND SAFETY GASIFICATION SYSTEM FOR THE COMPRESSED GAS CARTRIDGE

BACKGROUND OF THE INVENTION

1. Field of Invention

The present invention relates to an airsoft gun, more particularly to the airsoft gun with improved reality.

2. Related Art

A survival game has already been a leisure activity which people are often taking People can use toy guns in hands to emulate a real field combat situation and can play team games with others to develop a tacit understanding of the games and to obtain an entertainment effect. The toy gun usually uses air as its power source to achieve a shooting effect by air to drive the bullets in a frame and the power source can keep providing to the toy gun using only a gas cylinder in the clip, when shooting.

There is significant commercial demand for toys that can fire hard plastic BB projectiles. A category of such toys are known in the art as so-called "airsoft" guns. Although the BB projectiles comprise hard plastic, they are less dangerous than metal BB projectiles because they are less massive and therefore carry less momentum at a given velocity. Hence, airsoft players often fire airsoft guns at other players during airsoft games and competitions, without significant injury (so long as eyes are well protected).

Furthermore, a current virtual-reality field shooting exercise has been one of the popular recreation activities, wherein players are pursuing a feeling as if shooting with a real gun, thereby enabling a pulling of a trigger to become one of the indispensable factors.

Accordingly, how to solve the aforementioned problems is a technical issue to be resolved by the inventor of present invention.

SUMMARY OF THE INVENTION

It is an objective of this invention to provide an airsoft gun with a gas shunting system. The gas shunting system divides a compressed high pressure air to drive out a projectile and guide to move a hammer block to generate impact for simulating recoil motion after shooting.

Another objective of this invention is to provide an airsoft gun with a dual hop up system to make the flight path be more stable and to enhance the flight range and accuracy.

It is an objective of this invention to provide an airsoft gun with a refilling system. The refilling system includes a dual magazine assembly for housing two different cartridges. The first magazine is capable of housing ball bullets and the second magazine is capable of housing ball bullets with shell cases.

It is an objective of this invention to provide an airsoft gun with a gasification system could make the supplied amount of the output compressed high pressure air be almost constant to enhance security during operation.

In order to implement the abovementioned, this invention discloses an airsoft gun with a dual hop up (DHU) system, a recoil motion system, a gasification system, a refilling system, and a gas shunting system. The airsoft gun further comprises an inner barrel and an outer barrel. The outer barrel has an air inlet and an air outlet, a back block, a front block and the hammer block are disposed between the inner barrel and the outer barrel. A hammer block spring is attached to an inner surface of the back block in the inner barrel. At the end of the hammer block spring on the opposite side to the back block, the hammer block is attached. The compressed high pressure air are guided from the air inlet to move the hammer block. The compressed high pressure air is released from the air outlet when the hammer block punches the back block. The hammer block spring pushes the hammer block back to punch the front block to generate impact for simulating recoil motion.

The dual hop up system includes a first boss portion, located at the inner surface of the inner barrel near to a bore of the airsoft gun to make a projectile rotate to increase its range of flight, and a second boss portion, located at the inner surface of the inner barrel and adjacent to the first boss portion to correct a rotating axis of the projectile to make the flight path be more stable.

The gasification system includes a compressed gas cartridge and a vaporization tube. One end of the vaporization tube is exposed to the compressed gas cartridge and the other end is extended into the compressed gas cartridge near to a substantial center therein to make the supplied amount of output compressed high pressure air be constant. The distance between the end of the vaporization tube and a liquid air inside the compressed gas cartridge is the same to make a pressure of a gaseous air be constant to enhance security during operation.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow illustration only, and thus are not limitative of the present invention, and wherein:

FIG. **1** is respective view of the airsoft gun in accordance with the present invention;

FIGS. **2**A-**2**B are respective views of the refilling system in accordance with the present invention when the first magazine is utilized;

FIGS. **2**C-**2**E are respective views of the refilling system in accordance with the present invention when the second magazine is utilized;

FIGS. **3**A-**3**B are sectional views of the dual hop up (DHU) system in accordance with the present invention;

FIGS. **4**A-**4**D are sectional views of the simulating recoil motion in accordance with the present invention; and

FIGS. **5**A-**5**D are respective views of the gasification system in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The purpose, construction, features, and functions of the invention can be appreciated and understood more thoroughly through the following detailed description with reference to the attached drawings.

Please refer to FIG. **1**, the airsoft gun of the present invention includes a gun body **1** with a dual hop up (DHU) system **2**, a recoil motion system **3**, a gasification system **4**, a refilling system **5**, and a gas shunting system **6**.

Please see FIGS. **2**A-**2**E, the refilling system **5** of the present invention includes a dual magazine assembly **50** for

housing two different cartridges. The first magazine **50***a* is capable of housing ball bullets **90** and the second magazine **50***b* is capable of housing ball bullets **90** with shell cases **60**.

Please refer to FIGS. **2**A-**2**B, which are respective views of the refilling system in accordance with the present invention when the first magazine is utilized.

The first magazine **50***a* is a hollow member with one end being a closed end **51***a* and is capable of housing ball bullets **90** therein. A magazine spring **52***a* is attached to the inner surface of the closed end **51***a* in the first magazine **50***a*. At the end of the magazine spring **52***a* on the opposite side to the closed end **51***a*, a magazine follower **53***a* that pushes ball bullets **90** is attached. The first magazine **50***a* includes a hollow slider **54** to hold the ball bullets **90**. The Ball bullets **90** are guided away from the first magazine **50***a* through an opening provided by the slider **54**.

The first action **70***a* includes a shell case front end **60***a*. The shell case front end **60***a* has a through hole **62***a* with an opening **61***a*. When the first action **70***a* is pushed, the first one ball bullet **90**, which is slightly outside of the slider **54**, would be mounted on the opening **61***a* of the shell case front end **60***a* of the first action **70***a*. The slider **54** is pushed downward to the first magazine **50***a* along to the sidewall of the first action **70***a*. Then, the ball bullet **90** is pushed into the bore **80** to refill.

After shooting, the ball bullet **90** is shot and the first action **70***a*, including the shell case front end **60***a*, is pulled back to leave away from the bore **80**. The slider **54** would move upward along to the sidewall of the first magazine **50***a*. And one of the ball bullets **90** inside the first magazine **50***a* is pushed to be slightly outside of the top end of the slider **54**, as shown in FIG. **2**A. Therefore, even the bullets are ball bullets **90**, such as BB bullets, steel balls or paintballs, the airsoft gun could simulate refilling action as real bolt-action, single-shot rifles to increase the reality.

Please refer to FIGS. **2**C-**2**E, which are respective views of the refilling system in accordance with the present invention when the second magazine is utilized.

In this embodiment, a second magazine **50***b* is located adjacent to the first magazine **50***a*. The second magazine **50***b* is also a hollow member with one end being a closed end **51***b* and is capable of housing ball bullets **90** with shell cases **60** therein. A magazine spring **52***b* is attached to the inner surface of the closed end **51***b* in the second magazine **50***b*. At the end of the magazine spring **52***b* on the opposite side to the closed end **51***b*, a magazine follower **53***b* that pushes ball bullets **90** with shell cases **60** is attached. The Ball bullets **90** with shell cases **60** are guided away from the second magazine **50***b* through an top opening thereof.

The second action **70***b* includes a jaw **71***b* and a case ejector **72***b* at the front end. When the second action **70***b* is pushed, the first one ball bullet **90** with shell case **60** would be pushed toward into the bore **80**. And the bullet groove **61** is clipped by the jaw **71***b* to refill. And the shell case **60** has a through hole **62**.

After shooting, the ball bullet **90** is shot and the second action **70***b* together with the shell case **60** are pulled back to leave away from the bore **80**. The shell case **60** is ejected by the case ejector **72***b*. Therefore, in this embodiment, the airsoft gun could simulate refilling and ejecting actions as real bolt-action, single-shot rifles to increase the reality.

Moreover, the refilling system **5** of the present invention includes a dual magazine assembly **50** for housing two different cartridges. Each cartridge is utilized a different action, the first action **70***a* and the section action **70***b*. The users can change actions depends on which cartridge is utilized.

Please refer to FIGS. **3**A-**3**B, which are sectional views of the dual hop up (DHU) system in accordance with the present invention.

The dual hop up (DHU) system **2** includes a first boss portion **21** and a second boss portion **22** at an inner surface of the inner barrel **20**. The first boss portion **21** is located at the inner surface of the inner barrel **20** near to the bore **80**, i.e. the right side in FIG. **3**A. When the ball bullet **90** enters into the inner barrel **20**, the friction occurred between the first boss portion **21** and the ball bullet **90** would make the ball bullet **90** rotate to increase its range of flight. As shown in FIG. **3**A, the ball bullet **90** would rotate counter-clockwise. The second boss portion **22** is located at the inner surface of the inner barrel **20** and adjacent to the first boss portion **21**. The function of the second boss portion **22** is different from the function of the first boss portion **21**. When the ball bullet **90** enters into the inner barrel **20**, the initial velocity is very high. During friction of the first boss portion **21**, the friction point may not be the center point of the ball bullet **90** to cause the rotating axis of the ball bullet **90** to be shift. The flight path would be unstable. Therefore, by the second boss portion **22**, the rotating axis of the ball bullet **90** is corrected to make the flight path be more stable, especially is horizontal flight path.

Please refer to FIG. **3**B, the first boss portion **21** includes a single protrusion to make the ball bullet **90** rotate. And the second boss portion **22** includes a plurality of protrusions. As shown in FIG. **3**B, the second boss portion **22** includes two protrusions to make the ball bullet **90** rotate and fly more stable. The material of the protrusions is elastics material, such as rubber. The height of the protrusions may be adjustable to modify the friction between the protrusions and the ball bullet **90** to enhance the flight range and accuracy.

Please refer to FIGS. **4**A-**4**D, which are sectional views of the simulating recoil motion in accordance with the present invention.

When the airsoft gun is triggered, a delay mechanism is enabled. The delay mechanism includes an air valve **30**, a pin **31**, a collapsing spring **32**, a relief lever **33** and a valve spring **35**. The air valve **30** is opened when the airsoft gun is triggered, and the pin **31** is moved down to be against the air valve **30** to keep the air valve **30** opening. The compressed high pressure air are shunted by the gas shunting system **6**. The gas shunting system **6** is integrated with the gun body **1** of the airsoft gun. The compressed high pressure air are divided to drive out the ball bullets **90** and guide to the air inlet **11**.

The outer barrel **10** has the air inlet **11** and the air outlet **12**. A back block **23**, a front block **29** and a hammer block **24** are disposed between the inner barrel **20** and the outer barrel **10**. The hammer block **24** is a sleeve member to be put on the inner barrel **20**. A hammer block spring **25** is attached to the inner surface of the back block **23** in the outer barrel **10**. At the end of the hammer block spring **25** on the opposite side to the back block **23**, the hammer block **24** is attached. An outer ring **26** and an inner ring **27** are disposed to the hammer block **24** to make contact with the inner surface of the outer barrel **10** and the outer surface of the inner barrel **20** respectively. A chamber **28** within the outer barrel **10** is formed by the front block **23**, the outer ring **26** and the inner ring **27**. The hammer block **24** is moveable along the inner barrel **20** between the front block **29** and the back block **23**. When the compressed high pressure air are guided into the chamber **28** from the air inlet **11**, the hammer block **24** is pushed to slide along the inner barrel **20**. The hammer block spring **25** is pressed and the gun body **1** is moved forward slightly due to the reacting force.

When the hammer block **24** slides toward the back block **23** and pushes a collapsing slider **321** of the collapsing spring **32**,

the collapsing slider **321** would be moved downward along to the inclined plane **322** of the collapsing spring **32**. The collapsing spring **32** is moved backward to push the relief lever **33** to lift the pin **31**. When the pin **31** is lifted, the air valve **30** is released by the valve spring **35** to be closed. The compressed high pressure air is stopped to be supplied. By the inclined plane **322** of the collapsing spring **32**, the hammer block **24** slides to push the collapsing slider **321** of the collapsing spring **32** without crash the delay mechanism. Furthermore, by the delay mechanism, the compressed high pressure air are still supplied to push the hammer block **24** after the ball bullets **90** are driven out.

After the delay mechanism is released, the hammer block **24** still slides to punch the back block **23** to generate impact. The compressed high pressure air within the chamber **28** is released by the air outlet **12**, as shown in FIG. **4**C. After the compressed high pressure air within the chamber **28** is released, the hammer block spring **25** pushes the hammer block **24** back due to the spring force of compression. The gun body **1** is moved backward slightly due to the reacting force. The hammer block **24** still slides to punch the front block **29** to generate impact. Therefore, by those impact and the reacting force, the airsoft gun could simulate recoil motion after shooting as a real gun to increase the reality.

The hammer block **24** includes an inclined groove **241** at the outer surface and the outer ring **26** is disposed therein. During the hammer block **24** slides toward the back block **23**, the outer ring **26** is moved along the inclined groove **241** to increase airtight performance. The transformation caused by temperature of the outer ring **26** to decrease airtight performance would be overcome. And the recoil motion performance is also improved.

Please refer to FIGS. **5**A-**5**D, which are respective views of the gasification system in accordance with the present invention.

The airsoft gun is powered by a compressed gas cartridge **40**. The compressed gas cartridge **40** contains liquid air **42**. The liquid air **42** tends to flow to low position.

Therefore, angle for usage of the airsoft gun is limited. When the muzzle of the airsoft gun is lowered or heightened, the liquid air **42** may be stayed at the outlet or the bottom of the gas cartridge **40**. It causes the liquid air **42** to excess or too less output. It is dangerous and unstable for the airsoft gun.

The gasification system **4** includes a compressed gas cartridge **40**, and a vaporization tube **41**. One end of the vaporization tube **41** is exposed to the compressed gas cartridge **40**, and the other end is extended into the compressed gas cartridge **40** near to the center therein, a balance point. Because the distance to the liquid air **42** is near the same in each angle of the compressed gas cartridge **40**, the pressure of the gaseous air **43** is constant. Therefore, whatever the angle of the compressed gas cartridge **40** is, the supplied amount of the output compressed high pressure air is almost constant.

Please refer to FIGS. **5**A-**5**D, the compressed gas cartridge **40** stays at 180 degrees, 45 degrees, 90 degrees, and 270 degrees, respectively. Without the vaporization tube **41**, the output pressure may be too low as shown in FIGS. **5**B-**5**C, due to the liquid air **42** is too far to the outlet. The liquid air **42** may be leaked directly without vaporization, as shown in FIG. **5**D. By the vaporization tube **41** of this invention, the distance between the vaporization tube **41** to the liquid air **42** is near the same in each angle. The pressure of the gaseous air **43** is constant. The supplied amount of the output compressed high pressure air is almost constant. Especially is at 270 degrees shown in FIG. **5**D, the vaporization tube **41** keeps the liquid air **42** without leaking. Hence, the security during operation is enhanced.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

What is claimed is:

1. An airsoft gun comprising an inner barrel and an outer barrel, the outer barrel has an air inlet and an air outlet, a back block, a front block and a hammer block are disposed between the inner barrel and the outer barrel, a hammer block spring is attached to an inner surface of the back block in the outer barrel, at the end of the hammer block spring on the opposite side to the back block, the hammer block is attached; wherein a compressed high pressure air is guided from the air inlet to move the hammer block, and the compressed high pressure air is released from the air outlet when the hammer block punches the back block, and the hammer block spring pushes the hammer block back to punch the front block to generate impact for simulating recoil motion after shooting.

2. The airsoft gun of claim **1**, wherein an outer ring and an inner ring are disposed to the hammer block to make contact with the inner surface of the outer barrel and the outer surface of the inner barrel respectively to form a chamber within the outer barrel by the front block, the outer ring and the inner ring, the hammer block is moveable along the inner barrel between the front block and the back block, wherein the hammer block includes an inclined groove at the outer surface and the outer ring is disposed therein.

3. The airsoft gun of claim **1**, further comprises a delay mechanism, the delay mechanism includes:

an air valve, being opened when the airsoft gun is triggered, to output the compressed high pressure air;

a pin, being moved down to be against the air valve to keep the air valve open;

a collapsing spring, being pushed by the hammer block during sliding toward the back block;

a relief lever, connected to the collapsing spring, wherein the relief lever lifts the pin when the collapsing spring is pushed; and

a valve spring, connected to the air valve, wherein when the pin is lifted, the air valve is closed by the valve spring.

* * * * *